

App. No. 10/065,738
Amendment dated October 17, 2003
Reply to Office action of July 18, 2003

Amendment to the Specification (other than claims):

Please replace paragraph [0015] with the following amended paragraph:

[0015] The invention in being a Faraday rotator having wavelength selectivity, for selectively rotating only the polarization plane of incident light of given wavelengths, is characterized in being furnished with: a magneto-optical ~~part~~ section that rotates the polarization plane of incident light traveling in the direction of its magnetic field; and a dielectric multi-layer film in which a low refractive-index layer and a high refractive-index layer are laminated in alternation, for localizing within the magneto-optical ~~part~~ section incident light of at least one wavelength.

Please replace paragraph [0016] with the following amended paragraph:

[0016] Preferably, the dielectric multi-layer film is characterized in localizing within the magneto-optical ~~part~~ section incident light beams of plural wavelengths.

Please replace paragraph [0017] with the following amended paragraph:

[0017] Further preferably, the magneto-optical ~~part~~ section is characterized in being constituted from a gadolinium iron garnet thin film.

Please replace paragraph [0019] with the following amended paragraph:

[0019] Further preferably, the magneto-optical ~~part~~ section and the dielectric multi-layer film are characterized in being formed integrally by a vapor-phase process.

Please replace paragraph [0020] with the following amended paragraph:

App. No. 10/065,738
Amendment dated October 17, 2003
Reply to Office action of July 18, 2003

[0020] Under a separate aspect the invention in being an optical isolator having wavelength selectivity, for selectively blocking only return beams from incident light of given wavelengths, is characterized in being furnished with: a magneto-optical ~~part~~ section for rotating the polarization plane of incident light traveling in the direction of its magnetic field; a magnetic part for applying a magnetic field to the magneto-optical ~~part~~ section; a dielectric multi-layer film in which a low refractive-index layer and a high refractive-index layer are laminated in alternation, for localizing within the magneto-optical ~~part~~ section incident light of at least one wavelength; a polarizer for picking out polarized components from incident beams; and an analyzer utilized in combination with the polarizer.

Please replace paragraph [0021] with the following amended paragraph:

[0021] Preferably, the dielectric multi-layer film characterized in localizing within the magneto-optical ~~part~~ section incident light beams of plural wavelengths.

Please replace paragraph [0022] with the following amended paragraph:

[0022] Further preferably, the magneto-optical ~~part~~ section is characterized in being constituted from a gadolinium iron garnet thin film.

Please replace paragraph [0023] with the following amended paragraph:

[0023] Further preferably, the magnetic part is characterized in being constituted from a gallium nitride magnetic semiconductor thin film that exhibits ferromagnetism at room temperature and is transparent to light.

Please replace paragraph [0027] with the following amended paragraph:

App. No. 10/065,738
Amendment dated October 17, 2003
Reply to Office action of July 18, 2003

[0027] Further preferably, the magneto-optical ~~part section~~, the magnetic part, the dielectric multi-layer film, the polarizer, and the analyzer are characterized in being formed integrally by a vapor-phase process.

Please replace paragraph [0053] with the following amended paragraph:

[0053] This Faraday rotator 30 is furnished with, as shown in Fig. 1, a magneto-optical ~~part 30-1~~ section 30-4 for rotating the polarization plane of incident light traveling in the direction of its magnetic field, and dielectric multi-layer films 30-2 for localizing within the magneto-optical part 30-1 incident light of at least one wavelength. The magneto-optical section 30-4 is made up of magneto-optical parts 30-1, 30-1 and a dielectric layer 30-3 interlaminated in between the magneto-optical parts 30-1, 30-1.

Please replace paragraph [0054] with the following amended paragraph:

[0054] The magneto-optical ~~part 30-1~~ is parts 30-1, 30-1 are constituted from a gadolinium iron garnet (GIG hereinafter) thin film, and the dielectric multi-layer films 30-2 are composed by laminating in alternation silicon oxide as a low refractive index layer, and titanium oxide as a high refractive index layer.

Please replace paragraph [0055] with the following amended paragraph:

[0055] As shown in Fig. 1, the Faraday rotator 30 is constituted by arranging the dielectric multi-layer films 30-2 on either side of the magneto-optical ~~part 30-1~~ parts 30-1, 30-1 to create a resonant structure. The resonant structure of the dielectric multi-layer films 30-2 enables localizing in the magneto-optical ~~part 30-1~~ section 30-4 incident light of a given wavelength. This as a result makes it possible to selectively rotate the polarization plane of incident light of a given wavelength.

App. No. 10/065,738
Amendment dated October 17, 2003
Reply to Office action of July 18, 2003

Please replace paragraph [0056] with the following amended paragraph:

[0056] Moreover, either adjusting the thickness of the magneto-optical ~~part 30-1~~ parts 30-1, 30-1, or interlaminating additional dielectric layer(s) into the magneto-optical ~~part 30-1~~ section 30-4, makes possible selectively rotating the polarization plane of incident light of not only a single but also a plurality of wavelengths. Furthermore, adjusting the thickness and layout of the magneto-optical ~~part 30-1~~ section 30-4 (including such additional dielectric layers as have been interlaminated therein) and the dielectric multi-layer films 30-2 enables controlling the wavelength, and controlling the number of wavelengths, of the incident-light whose polarization plane is rotated.

Please replace paragraph [0057] with the following amended paragraph:

[0057] In the following, the fact that the wavelength of, and the number of wavelengths of, the incident-light whose polarization plane is rotated are controllable by adjusting the thickness and layout of the magneto-optical ~~part 30-1~~ section 30-4 (including such additional dielectric layers as have been interlaminated therein) and the dielectric multi-layer films 30-2 will be explained using simulation results in Figs. 2 through 7.

Please replace paragraph [0064] with the following amended paragraph:

[0064] When this multi-layer film structure is illuminated with infrared light 1000 to 2000 nm in wavelength, as shown in Fig. 5, only incident light approximately 1420 nm in wavelength and approximately 1690 nm in wavelength resonates within the magneto-optical ~~part~~ section; and incident light in the vicinity thereof, in a wavelength region of from roughly 1250 nm to 1850 nm, is blocked. From these simulation results, it is evident that the resonant peak values of two wavelengths of incident light that is localized within a magneto-optical ~~part~~ section can be varied by adjusting the thickness of the magneto-optical ~~part~~ section in the multi-layer film structure for Fig. 4. That by adjusting the thickness of its magneto-optical

App. No. 10/065,738
Amendment dated October 17, 2003
Reply to Office action of July 18, 2003

part section, a Faraday rotator made up of the multi-layer film structure in Fig. 5 acts to selectively rotate only the polarization planes of incident light of two wavelengths that are different from those in Fig. 4 can be ascertained from these results.

Please replace paragraph [0080] with the following amended paragraph:

[0080] From the simulation results in Figs. 2 through 7, it is evident that the wavelength of, and the number of wavelengths of, incident light whose polarization planes may be rotated utilizing the Faraday rotator 30 are controllable by adjusting the thickness and layout of the magneto-optical ~~part 30-1~~ section 30-4 (including such additional dielectric layers as have been interlaminated therein) and the dielectric multi-layer films 30-2.

Please replace paragraph [0081] with the following amended paragraph:

[0081] Thus from the foregoing, according to Embodiment 1, by means of a resonant structure in which the dielectric multi-layer films 30-2 are arranged on either side of the magneto-optical ~~part 30-1~~ section 30-4, the Faraday rotator 30 is capable of localizing incident light of not only a single wavelength, but also a plurality of wavelengths, within the magneto-optical ~~part 30-1~~ section 30-4.

Please replace paragraph [0082] with the following amended paragraph:

[0082] Moreover, being that the magneto-optical ~~part 30-1~~ section 30-4 and the dielectric multi-layer films 30-2 are jointly a thin-film structure, integrating them both is possible by means of thin-film lamination technology. This accordingly makes possible miniaturizing, and curtailing the cost of, the magneto-optical ~~part 30-1~~ section 30-4, the dielectric multi-layer films 30-2, and the Faraday rotator 30 in which they both are assembled, and furthermore simplifies the Faraday rotator 30 manufacturing process.